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IS 13122 (Part 2) : 1991

(Reaffirmed 2001)

भारतीय मानक

औद्योगिक-प्रक्रम-नियंत्रण तन्त्रों में प्रयुक्त ट्रांसमीटरों की विशिष्टि

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Indian Standard

TRANSMITTERS FOR USE IN INDUSTRIAL PROCESS CONTROL SYSTEMS — SPECIFICATION

PART 2 GUIDANCE FOR INSTALLATION, INSPECTION AND ROUTINE TESTING

UDC 621·396·61 : 65·011·56 : 621-523

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NEW DELHI 110002

July 1991

Price Group 2

Industrial Process Measurement and Control Sectional Committee, ET 18

FOREWORD

This Indian Standard (Part 2) was adopted by the Bureau of Indian Standards after the draft finalized by the Industrial Process Measurement and Control Sectional Committee had been approved by the Electrotechnical Division Council.

This standard is intended to provide guidance for installation, maintenance, technical guidance for inspection and routine testing of transmitters, for instance, as acceptance tests or after repair. For a full evaluation, IS 13122 (Part 1) : 1991 should be used. 'Quantitative criteria for acceptable performance shall be established by agreement between manufacturer and purchaser. The requirements of this standard shall be effective when agreed by the manufacturer and the purchaser.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

TRANSMITTERS FOR USE IN INDUSTRIAL PROCESS CONTROL SYSTEMS — SPECIFICATION

PART 2 GUIDANCE FOR INSTALLATION, INSPECTION AND ROUTINE TESTING

1 SCOPE

This standard (Part 2) applies to pneumatic and electric transmitters for use in industrial process control systems using analogue signals which are in accordance with IS 7722 : 1975, IS 7728 : 1984 or IS 8493 : 1977. The provisions of this standard are applicable in principle to transmitters having different design but continuous signals.

2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard:

IS No.	*Title*
13122 (Part 1) : 1991	Transmitters, for use in industrial process control systems : Part 1 Methods for evaluating the performance
7722 : 1975	Analogue pneumatic signals for process control systems
7728 : 1984	Analogue dc current signals for process control systems (*first revision*)
8493 : 1977	Analogue dc voltage signals for industrial process measurements and control systems

3 TERMINOLOGY

3.0 The following definition in addition to the definition given in IS 13122 (Part 1) : 1991 shall apply.

3.1 Acceptance Test

The acceptance test intends to prove to the purchaser that the device complies with certain conditions of its requirements as they appear in the contract.

4 SAFETY

4.1 Electrically powered transmitters shall be examined to determine the degree to which its design protects against accidental electric shock.

5 DOCUMENTARY INFORMATION

5.1 All the relevant publications supplied by the manufacturer, automatically and on request, shall be listed.

5.2 If they do not contain a clear description, with adequate diagrams, of the operation of the transmitter, or if they do not contain an adequate parts list and specification, the nature of the inadequacy shall be stated.

5.3 Additionally, any certificate indicating the degree of intrinsic safety and flame-proofing of electrically powered transmitters, shall be listed.

5.4 This information shall give details of the certificate numbers and the degree of protection provided.

6 INSTALLATION

6.1 The transmitter shall be installed and set to work according to the manufacturer's instructions, taking account of the various applications which may be met in practice and require different procedures.

6.2 The method of mounting specified by the manufacturer should be reported. Any restrictions on the use of the transmitter caused by this method of mounting shall be stated with explanations.

6.3 Any other aspects that may seem relevant to the ease or difficulty of installation shall be stated with explanations.

7 ROUTINE MAINTENANCE AND ADJUSTMENT

7.1 The operations considered to be necessary for routine maintenance and adjustment shall be carried out in accordance with the manufacturer's instructions. (As a guide, this should refer to those operations which should be carried out at least four times per year).

7.2 Any aspects that are relevant to the ease or difficulty of the effects of performing these operations shall be stated, giving suitable reasons.

8 REPAIR

8.1 It is usual for transmitters to be capable of division into a number of sub-assemblies and for manufacturers to mention detail repair procedures in terms of the removal and replacement of such sub-assemblies, which may or may not be suitable for further dismantling by users. To assess the ease with which repairs may be done, the subassemblies should be removed one at a time, each shall be dismantled as far as it is permissible and any parts damaged or otherwise requiring replacement shall be renewed.

8.2 Any aspects which are relevant to the ease or difficulty of performing these repairs shall be stated giving reasons.

9 PROTECTIVE FINISHES

9.1 The protective finishes on external parts specified by the manufacturer shall be listed with relevant comments.

10 DESIGN FEATURES

10.1 Any aspects of design or construction likely to cause difficulties in use shall be listed with reasons. So also should any features which appear to be of particular interest, for example, the degree of enclosure of the working parts, interchangeability of spares, and weather-proofing.

11 VARIANTS

11.1 Important variants or options shall be stated.

12 TOOLS AND EQUIPMENT

12.1 Tools and equipment essential to the installation, maintenance and repairs shall be listed.

13 TEST REPORT

13.1 In addition to the test results presented in accordance with this standard, the test report shall include the following:

a) Date and place of tests;

b) Reference to this standard;

c) Identification characteristics of the instrument tested (type, model, serial number, etc);

d) Ambient test conditions and corrections applied as specified in this standard;

e) Any significant occurrences likely to have influenced the results; and

f) When performance characteristics are specified by the manufacturer, they shall be tabulated alongside the actual test results.

14 PERFORMANCE TESTS

14.1 Environmental conditions at the location of testing shall be recorded.

Adjustments :

For lower range value, span and damping, the routine tests shall be carried out with the final manufacturing adjustments (for example, as acceptance test) or with the adjustments determined by the user (for example after repair).

The following tests shall be performed unless another series of tests is agreed to between the purchaser and the manufacturer. The sequence of the tests shall be agreed between the purchaser and the manufacturer. It will not affect the results of each test.

14.2 Measured Error and Hysteresis [*see* **7.1** to **7.1.4** of IS 13122 (Part 1) : 1991].

The input-output characteristic under reference conditions shall be measured in one measurement cycle traversing full range in each direction. For this, at least five points of measurement should be distributed over the range, they should include points at or near (within 10 percent of span) the lower and upper range values.

Determine the difference between each observed output value and its ideal output value. As the result, report the measured error and the hysteresis expressed in percentage of output span.

NOTE — For this test, measured error is defined as the greatest positive or negative error in the measuring cycle, and hysteresis is defined as a the greatest difference between upscale and downscale readings which are determined at each value of input.

14.3 Effects of Influence Quantities

Input signals

If the transmitter output is able to go at least 2 percent below its lower range value and at least 2 percent above its upper range value, the tests described below in **14.3.1**, **14.3.2**, **14.3.3** and **14.3.4** may each be conducted with input signals of 0 percent and 100 percent of span. Otherwise, suitable input signals of approximately 5 percent and 95 percent of span should be substituted.

Output load

Electrical transmitters should be connected to maximum rated output load (for current output).

14.3.1 *Power Supply Variations* [*see* **7.2.1.1** and **7.2.2.3** of IS 13122 (Part I) 1991].

Using each chosen input signal, measure and report the change of output in percentages of span at the following variations in power supply or at the manufacturer's stated limits, if smaller:

Voltage variation $\begin{matrix} + & 10 \text{ percent} \\ - & 15 \text{ percent} \end{matrix}$ of nominal ac or dc voltage.

Supply pressure variation ± 10 percent of nominal pressure.

14.3.2 *Ambient Temperatures* [*see* **7.2.10** of IS 13122 (Part I) : 1991].

Using each chosen input signal, measure and report the change in observed output value at each of the following sequences of ambient temperatures:

a) 27°C (reference),

b) Maximum operating temperature specified by the manufacturer,

c) 27°C,

d) Minimum operating temperature specified by the manufacturer, and

e) 27°C.

NOTE — If the reference temperature of 27°C cannot be controlled, a constant room temperature may be substituted for this condition.

Before measuring the influence effect, sufficient time (usually a few hours) shall be allowed for stabilization of the temperature of all parts of the transmitter.

Output changes should be stated as percentages of output span.

14.3.3 *Over-Range* [*see* **7.2.15** of IS 13122 (Part 1) : 1991].

The input shall be increased gradually to the maximum over-range specified by the manufncturer. After the over-range has been applied for 1 min, the input shall be reduced to the nominal lower range value. After a further 5 min have elapsed, using the same input levels as before, determine the changes in observed output values.

Differential pressure transmitters are to be tested for over-range effects in both directions. They shall be tested as described above, first over-ranging above the upper range value, and then over-ranging below the lower range value. The changes in output, determined after over-ranging in each direction, shall be reported.

Output changes should be stated as percentages of output span.

14.3.4 *Static Process Pressure* [*see* **7.2.16** of IS 13122 (Part 1) : 1991].

This test shall be carried out on transmitters other than pressure transmitters which in normal operation are subjected to process pressure.

The pressure shall be changed from atmospheric to the full working pressure of the instrument. (For some transmitters, this test is also carried out below atmospheric pressure). Using the same input levels as before, determine the changes in observed output values.

NOTE — Measuring the static pressure influence with inputs other than zero differential pressure is very difficult to realize for differential pressure transmitters. If this should be required, a separate agreement between manufacturer and purchaser is recommended.

Output changes should be stated as percentages of output span.

14.4 Step Response [*see* **8.2** of IS 13122 (Part 1) : 1991].

Load Conditions

Electrical transmitters :	Values specified by the manufacturer or a 0·1 µF capacitor in parallel with the reference load resistance.
Pneumatic transmitters :	An 8 m length of 4 mm internal diameter rigid pipe followed by a 20 cm^3 capacity.
Test :	Two steps corresponding to 80 percent of output span, preferably from 10 percent to 90 percent, then from 90 percent then from 90 percent to 10 percent, shall be applied. The time for the output to reach and remain within 1 percent of the span of its steady value shall be stated for each step. The amount of dead time and overshoot (in percentage of span), if any, shall be stated.

NOTE — If there is difficulty in generating or recording an accurate input step, due to the physical characteristics or range of the input variable, the dynamics required for this test should be agreed between the manufacturer and the purchaser.

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